LEEDS BECKETT UNIVERSITY

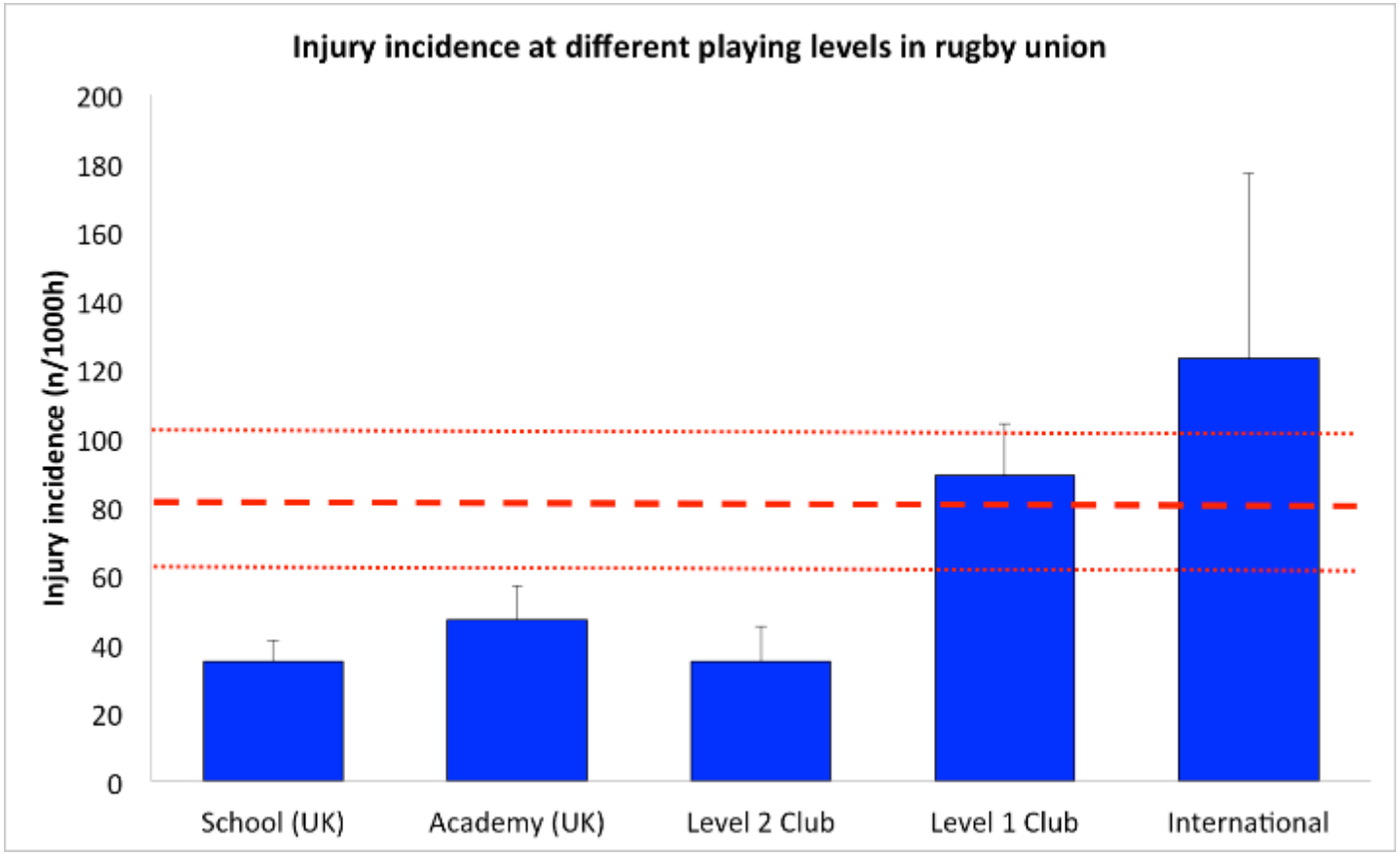
Injury risk management in rugby – Applications of single team epidemiology

Dr. Jason Tee

epidemiology [*ep”ĩ-de”me-ol’o-je*]

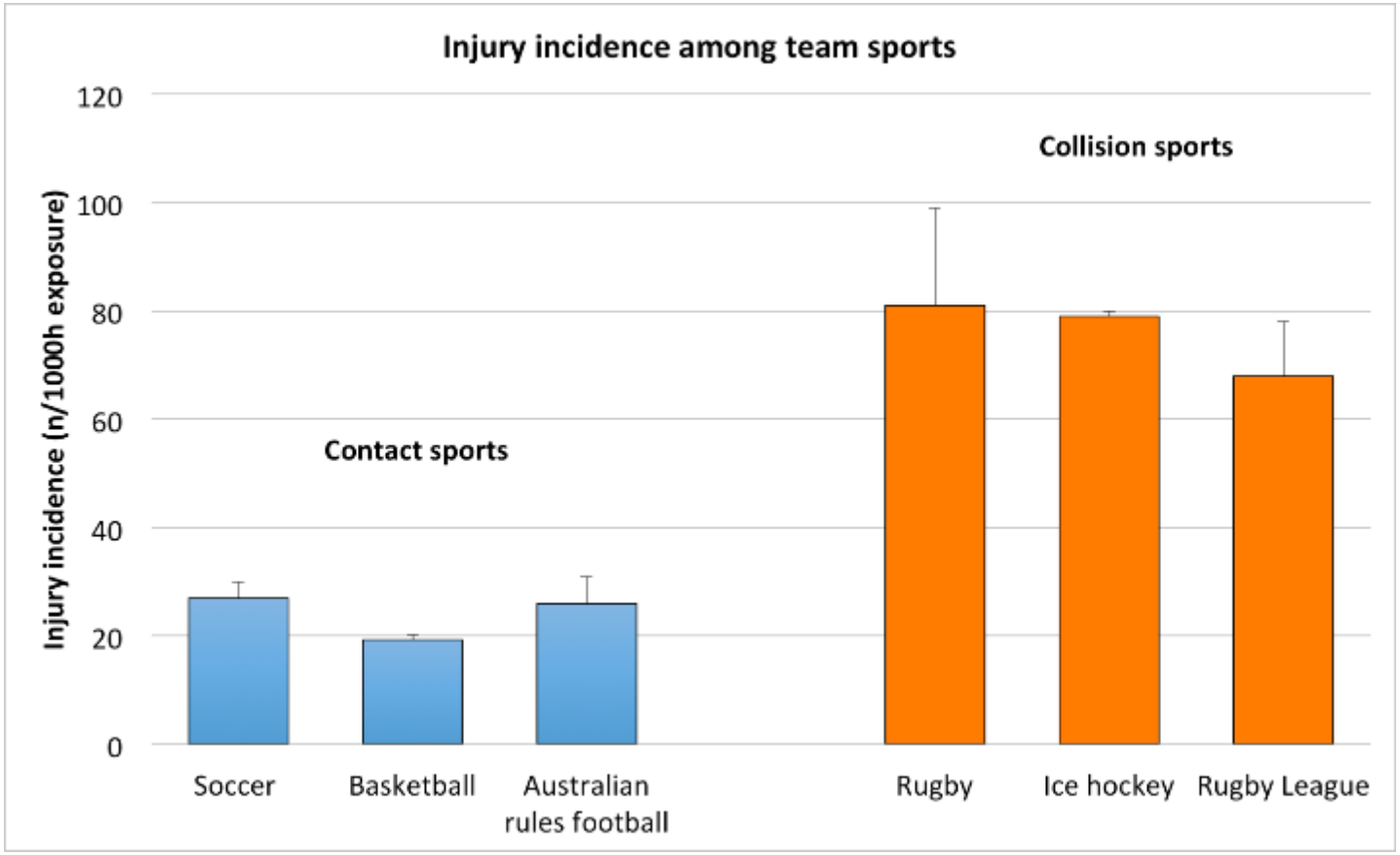
The science concerned with the study of factors determining and influencing the frequency and distribution of disease, **injury** and other health related events and their causes in a defined human population for the purpose of establishing programs to prevent and control their development and spread.

Epidemiology of rugby



Williams et al., Sports Med 2013

Epidemiology of rugby



Importance for state of the game

Law modifications

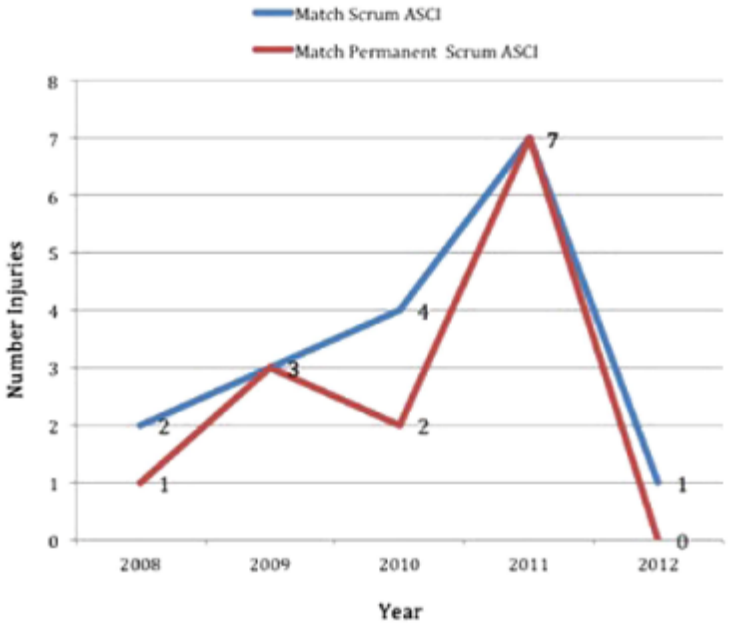


Figure 2 Pattern of match-related scrum acute spinal cord injuries (ASCI) between 2008 and 2012 in South Africa, including permanent injury trends.

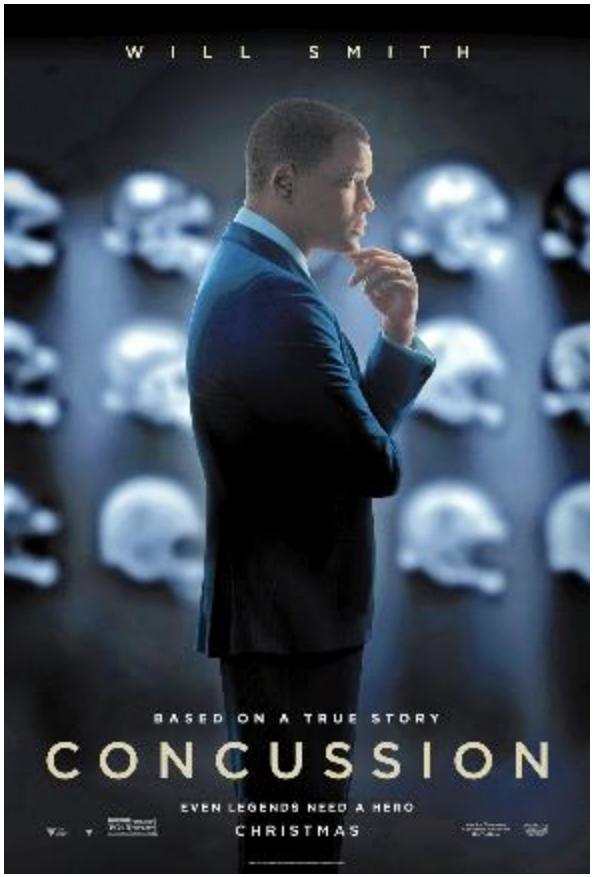
Hendricks et al., BJSM, 2014

Education programs

Fig. 2. Average absolute number of injuries per year pre-BokSmart (2008–2009) and post-BokSmart (2010–2013) in junior and senior players including incidence rate ratio (IRR) *Indicates that IRR is significantly different.

Brown et al., Scand J Med Sci Sports, 2016

Current challenges



Sport Collision Injury Collective
www.SportCIC.com

Sport Collision Injury Collective

1st March 2016

cc:

Anne Longfield OBE, Childrens Commissioner for England
Professor Sally Holland, Children's Commissioner for Wales
Tam Baillie, Children's Commissioner for Scotland
Koulla Woasouma, Children's Commissioner for Northern Ireland
Dr. Niall Muldoon, Ombudsman for Children for Northern Ireland

Professor Dame Sally Davies, Chief Medical Officer for England
Dr Ruth Hussey OBE, Chief Medical Officer for Wales
Dr. Catherine Calderwood, Chief Medical Officer for Scotland
Dr Michael McBride, Chief Medical Officer for the Republic of Ireland

Rt Hon Nicky Morgan, Secretary of State for Education for England
Huw Lewis AM, Minister for Education and Skills in Wales
Rt Hon Angela Constance, Secretary of State for Education and Lifelong Learning for Scotland
John O'Dowd MLA, Minister for Education in Northern Ireland
Jan O'Sullivan, Minister for Education for the Republic of Ireland

Rt Hon Jeremy Hunt, Secretary of State for Health for England
Rt Hon Shona Robison, Cabinet Secretary for Health, Wellbeing and Sport in Scotland
Mark Drakeford AM, Minister for Health and Social Services in Wales
Simon Hamilton MLA, Minister for Health, Social Services and Public Safety in Northern Ireland
Leo Varadkar, Minister for Health for the Republic of Ireland

Rt Hon John Whittingdale, Secretary of State for Culture, Media and Sport in England
Ken Skates AM, Deputy Minister for Culture, Sport and Tourism in Wales
Jamie Hepburn MSP, Cabinet Secretary for Health, Wellbeing & Sport in Scotland
Carál Ní Chuilín MLA, Minister for the Department of Culture, Arts and Leisure in Northern Ireland
Paschal Donohoe, Minister for Transport, Tourism and Sport in the Republic or Ireland.

epidemiology

Classical epidemiology studies require

- Huge sample sizes (entire population)
- Significant resources
- Long time spans
- Governing body responsibility

FAST

PRACTITIONER

IMMEDIATE DECISION-MAKING

HAS DIRECT APPLICATION

FAST, AUTOMATIC, INTUITIVE, NON-INVASIVE

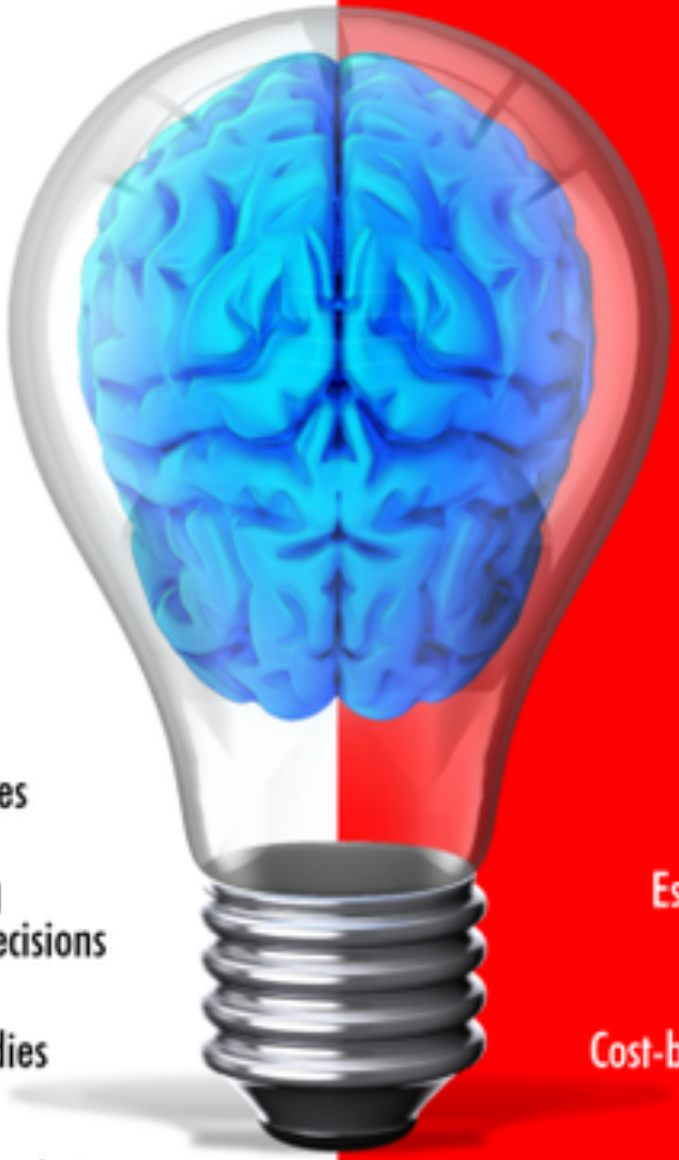
Service provision to players/coaches

Informing coach/medical decisions

Case studies

Dashboard analytics

FEEDS DATA TO RESEARCH



SLOW

RESEARCHER

QUALITY CONTROL, EXPLORATORY, VALIDATION

HAS INDIRECT APPLICATION

SLOW, DELIBERATE, FOCUSSED, EFFORT

Provides evidences for system

Establishing signal and noise

Cost-benefit analyses

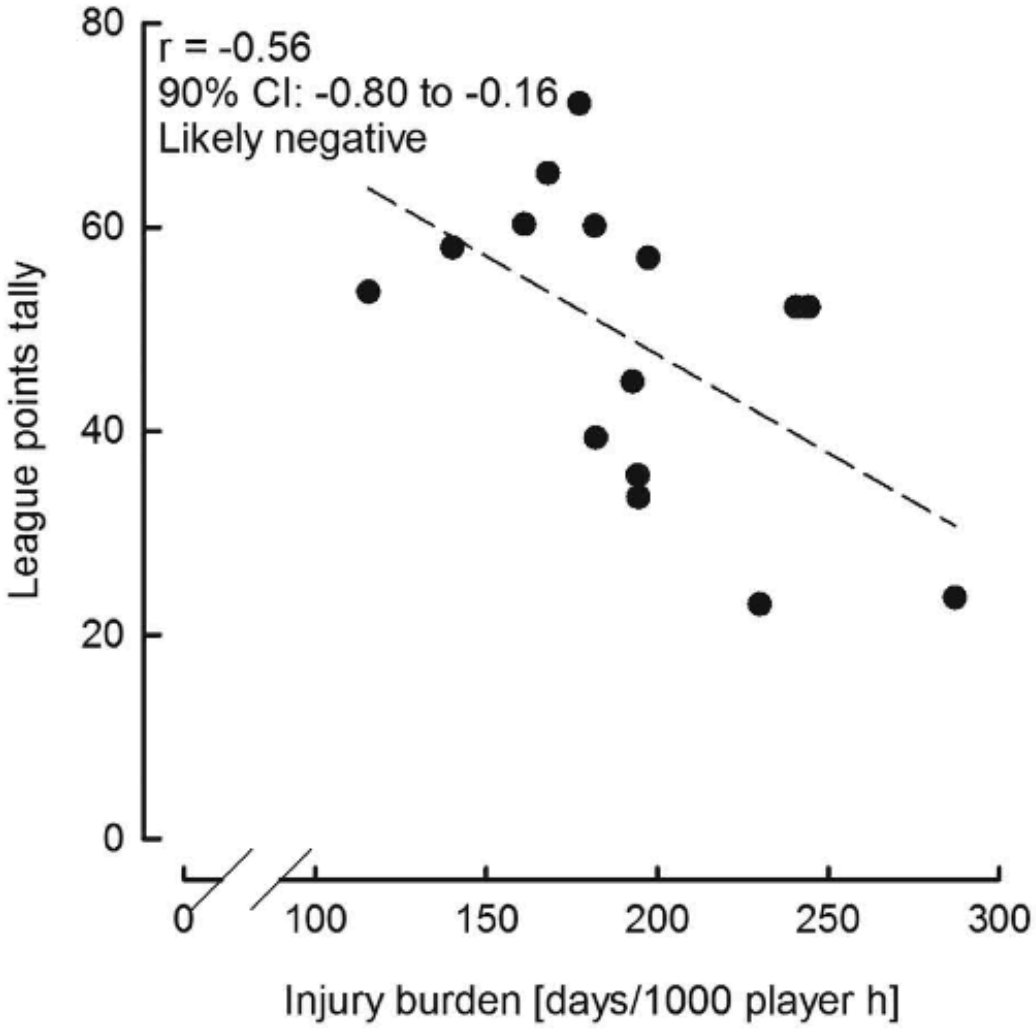
Statistics

PROVIDES EVIDENCE BASED TO DAILY SYSTEMS

Reference: Aaron J Coutts, IJSPP, in press

Designed by ©YLMSportScience

Injury vs. Performance



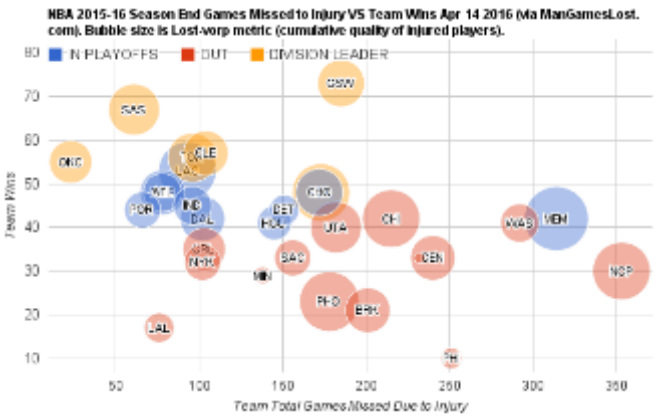
Williams et al., BJSM, 2015

Injury vs. performance

Injuries affect team performance negatively in professional football: an 11-year follow-up of the UEFA Champions League injury study

Martin Hägglund,[1,2] Markus Waldén,[2,3] Henrik Magnusson,[1,2] Karolina Kristenson,[2,3] Håkan Bengtsson,[2] Jan Ekstrand[2,3]

Football



Basketball

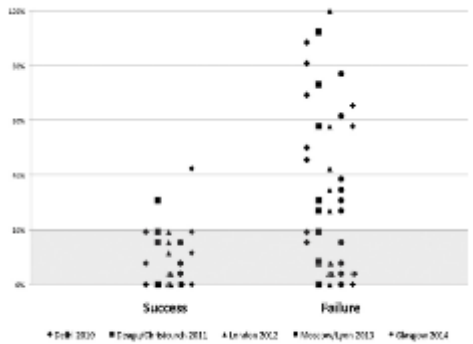
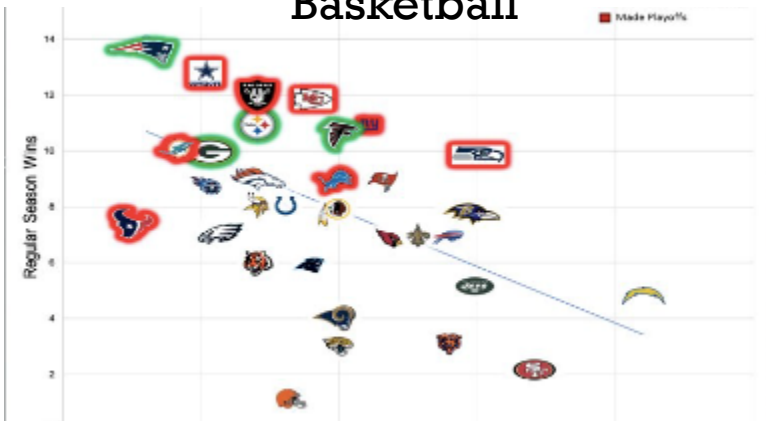


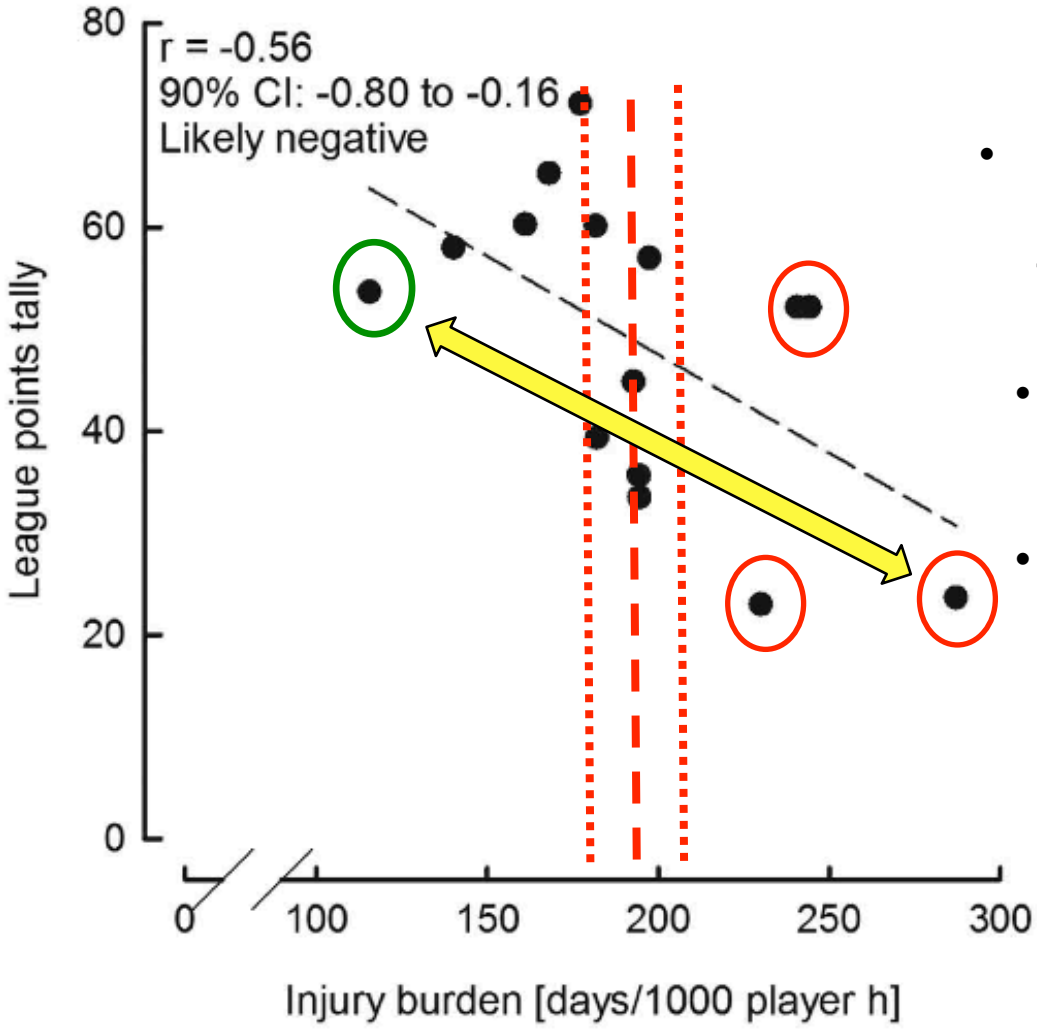
Fig. 1. Percentage modified training time by monitoring year for participants who failed or succeeded in reaching their key performance goal.

Track and field



American Football

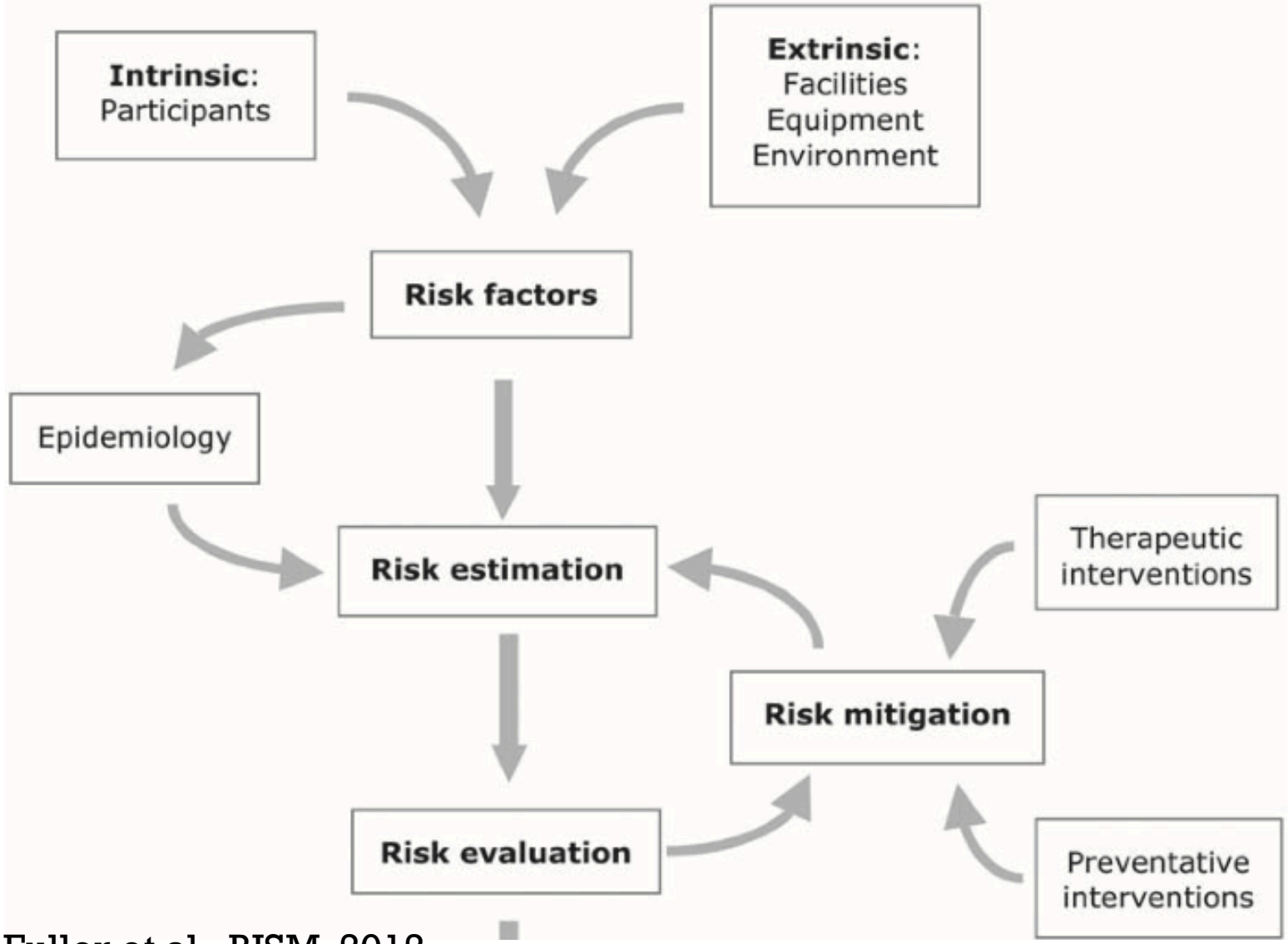
Injury vs. Performance



- What are these teams doing wrong?
  - What is this team doing right?
  - How do we get from here to here?

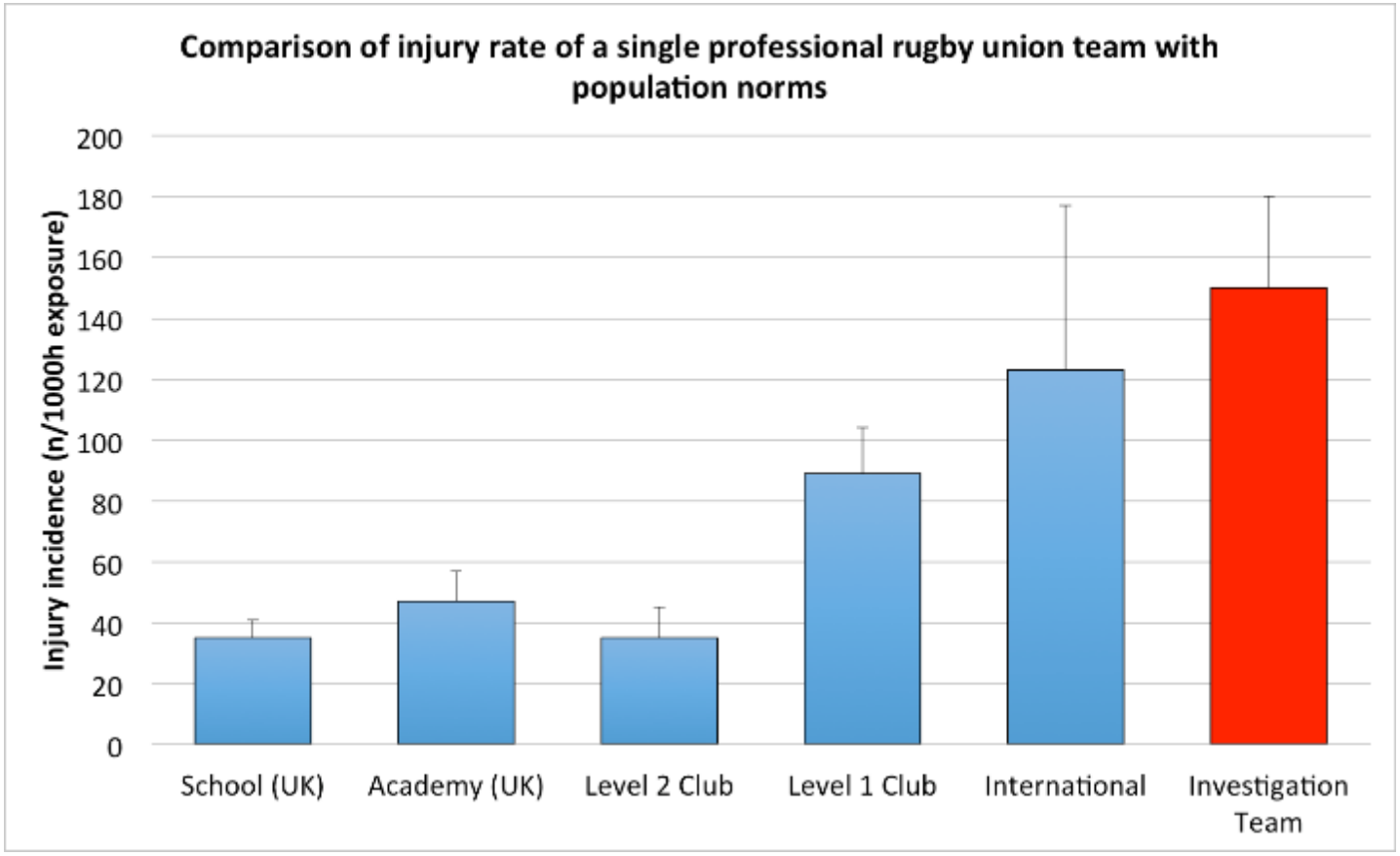
Williams et al., BJSM, 2015

Injury risk management model



Fuller et al., BJSM, 2012

Risk estimation

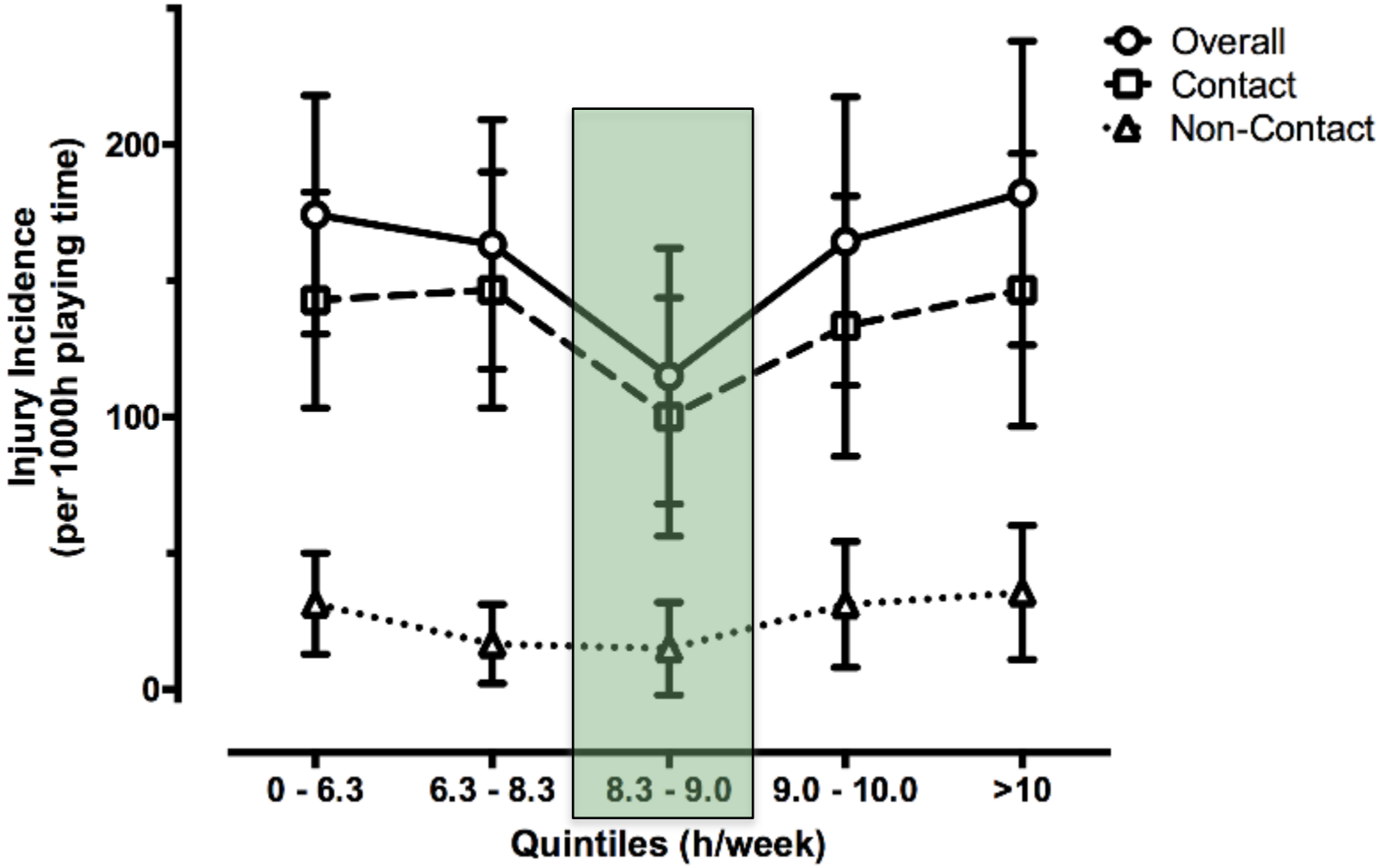


Targeting interventions

Perhaps the training prescription isn't right?

Injury Burden	
(total days lost)	3056
Injury circumstances	
(% total injury burden)	
Match	52.7
Training	47.3
Injury Mechanism %	
(% total injury burden)	
Contact	49.9
Non-Contact	50.1

The training sweet spot



Tee, unpublished observations

What do players actually have to do in matches?

ORIGINAL RESEARCH

Movement and impact characteristics of South African professional rugby union players

J C Tee, MSc (Exercise Science); Y Coopoo, DPhil, FACSM

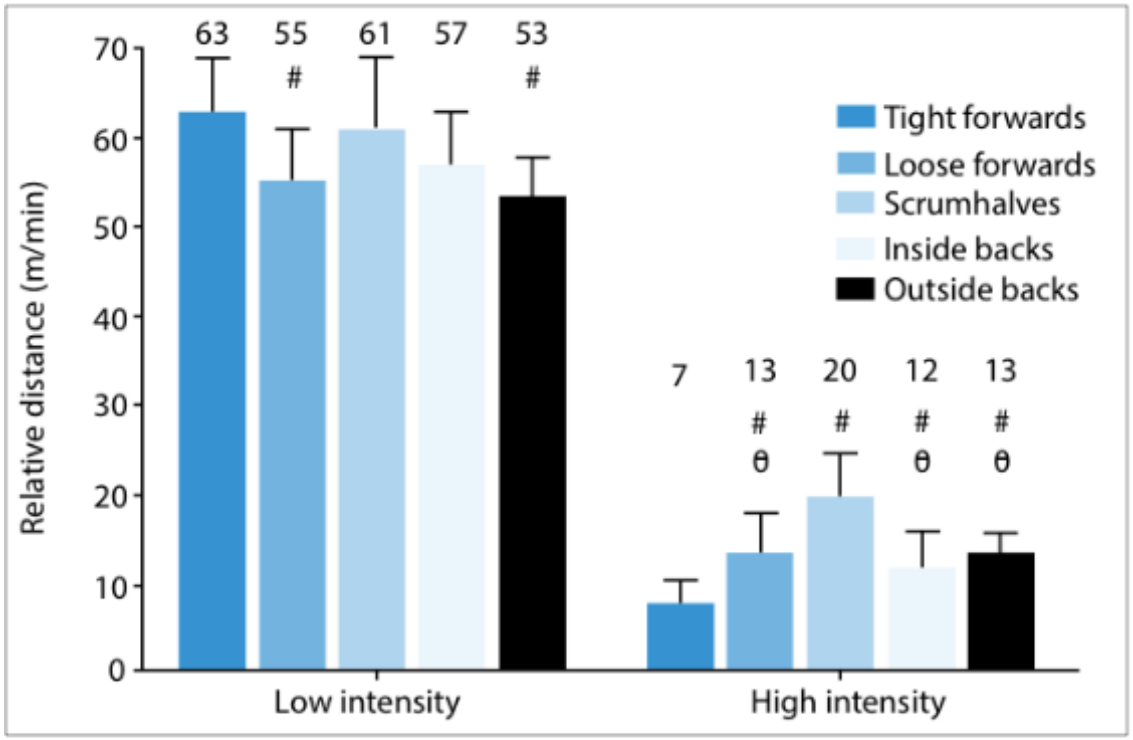
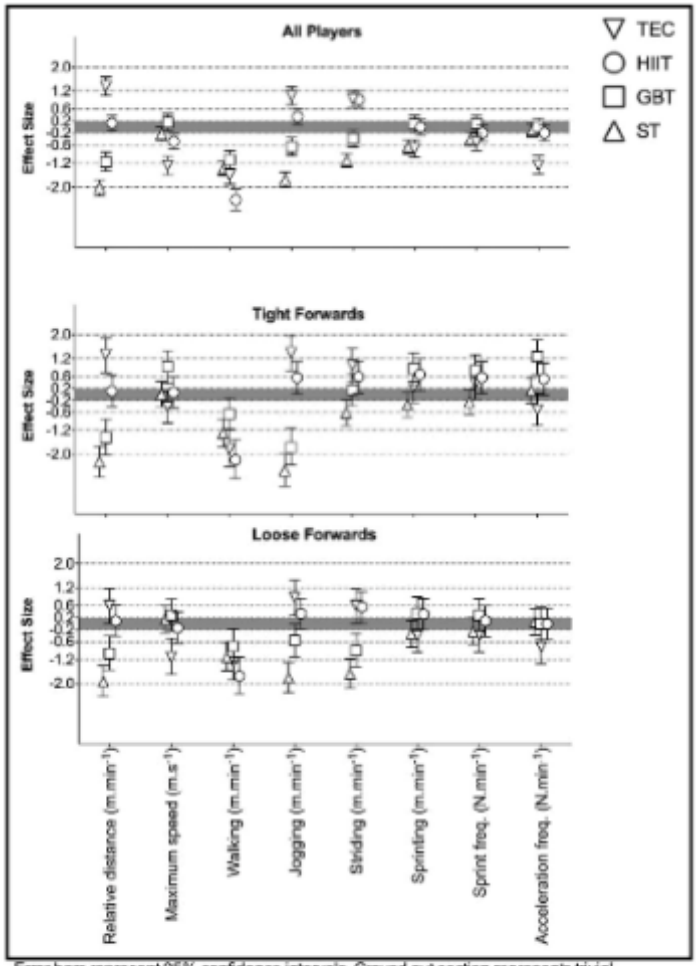
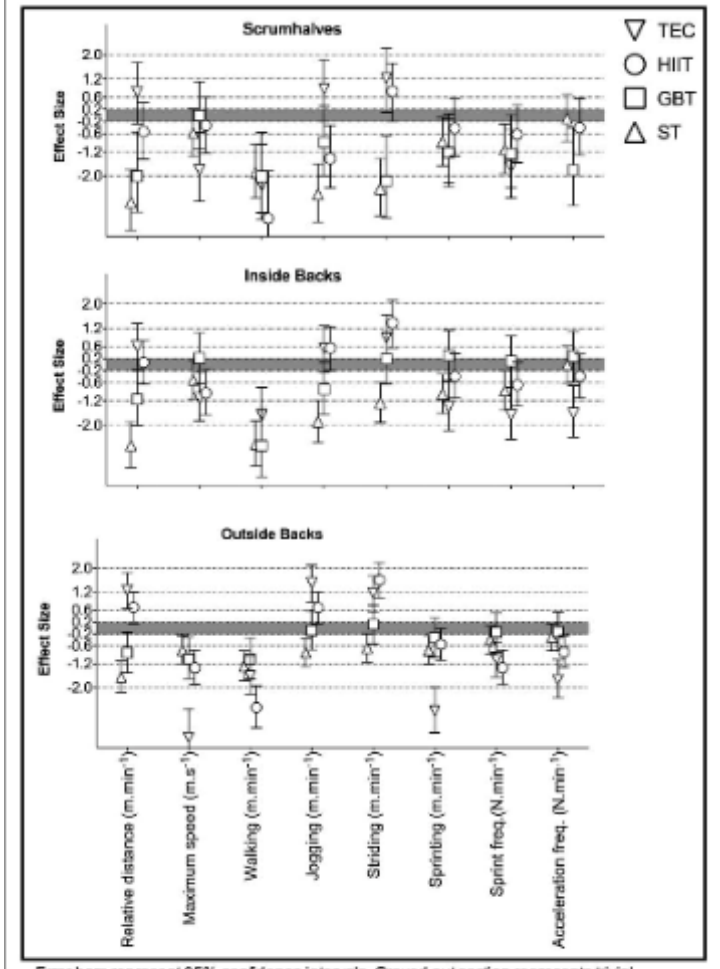


Fig. 4. Distance covered in high-intensity and low-speed zones by tight forwards, loose forwards, scrumhalves, inside backs and outside backs. (# and θ indicate significant difference from tight forwards and scrumhalves, respectively ($p<0.05$).)

How is this reflected in training?



Error bars represent 95% confidence intervals. Greyed out section represents trivial differences. TEC = Traditional endurance conditioning, HIIT = high-intensity interval training, GBT = game based training and ST = skills training. Distances are reported relative to activity time due to differences in duration of match and training exposures.



Error bars represent 95% confidence intervals. Greyed out section represents trivial differences. TEC = Traditional endurance conditioning, HIIT = high-intensity interval training, GBT = game based training and ST = skills training. Distances are reported relative to activity time due to differences in duration of match and training exposures.

Tee et al., IJSSC, 2016

So how did we do?

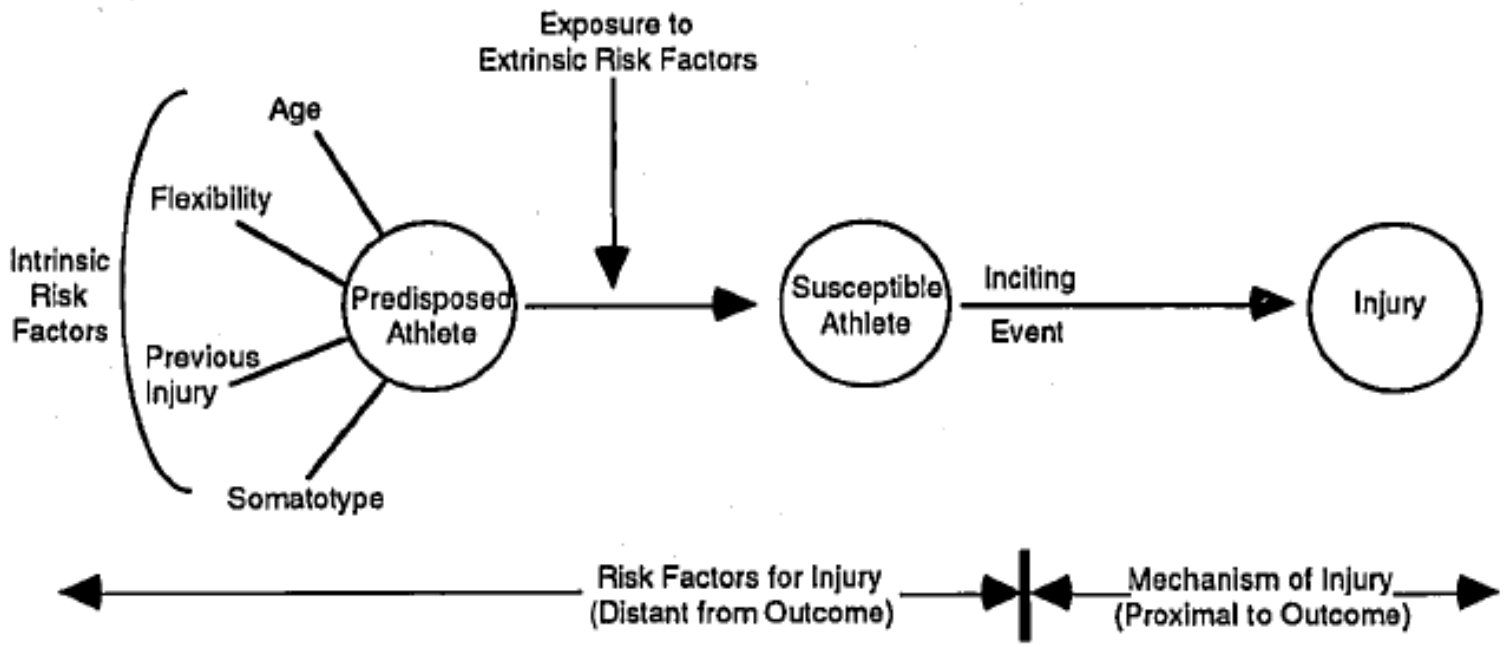
Injury Burden		
(total days lost)	3056	3647
Injury circumstances		
(% total injury burden)		
Match	52.7	72.5
Training	47.3	27.5*
Injury Mechanism %		
(% total injury burden)		
Contact	49.9	71.8
Non-Contact	50.1	28.2*

* indicates significant difference between 2012 and 2013, $p < 0.05$.


GO BACK AND
START AGAIN

Injuries are complicated

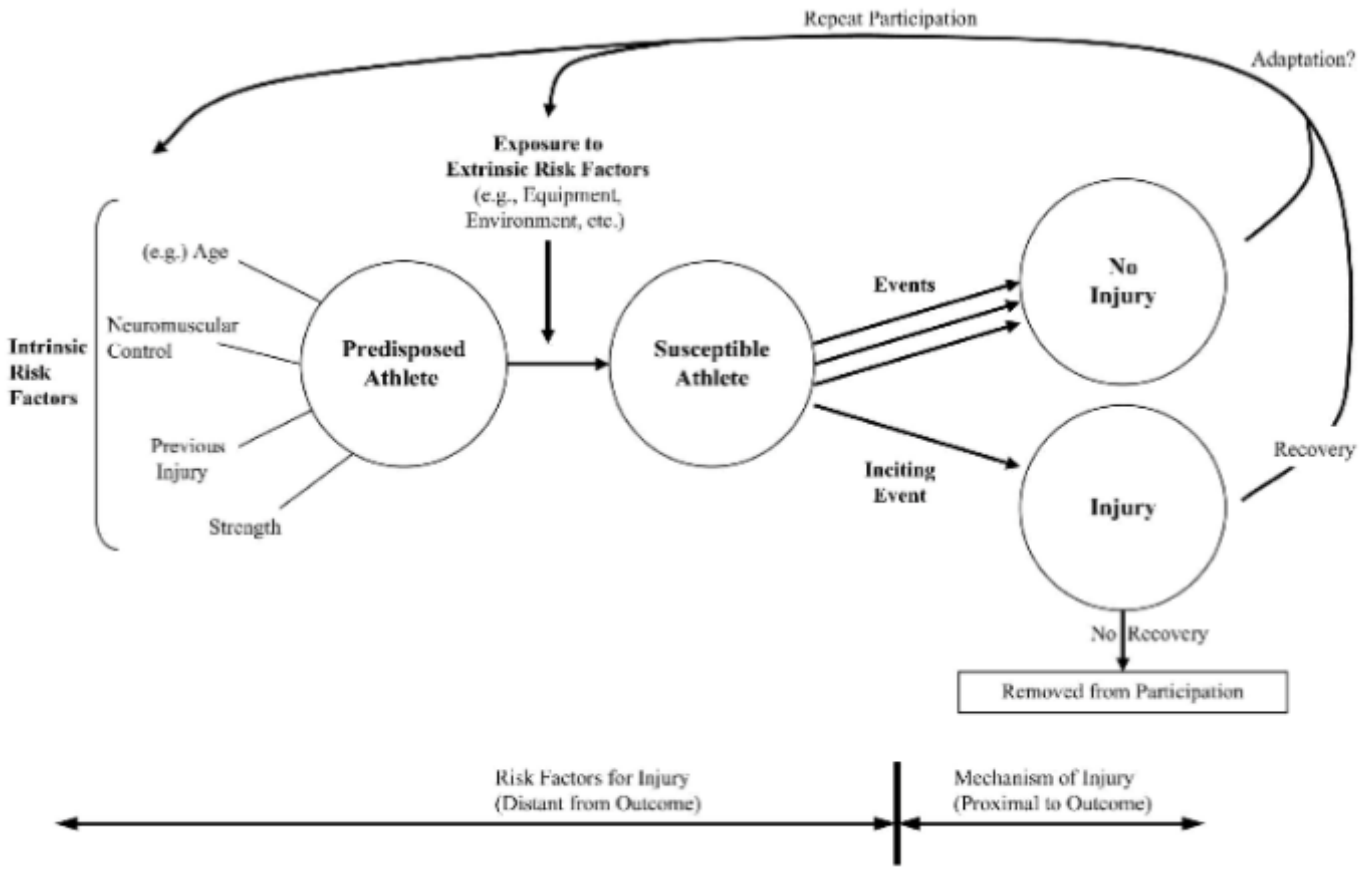
1994



Meeuwisse et. al., Clin J Sport Med, 1994

Injuries are complicated

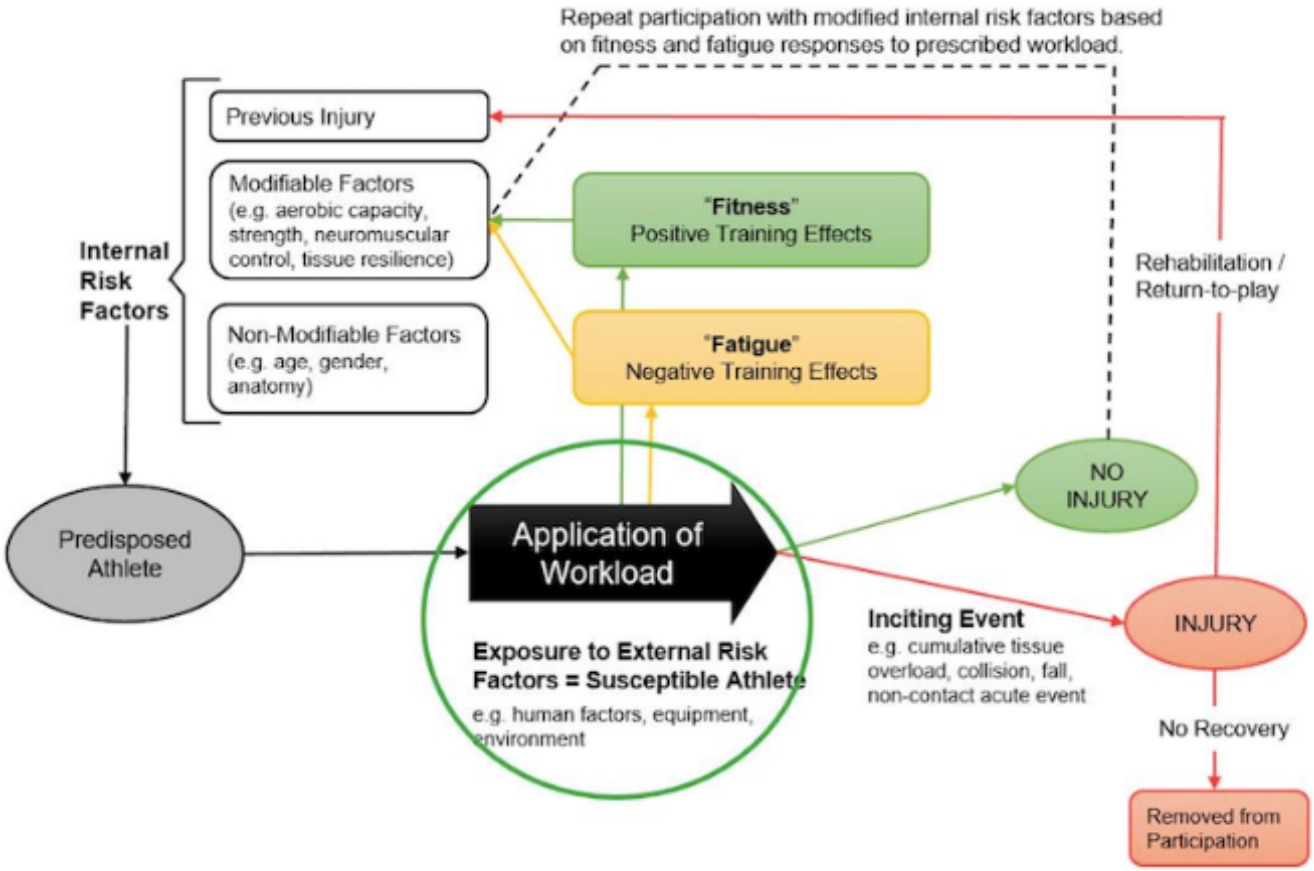
2007



Meeuwisse et. al., Clin J Sport Med, 2007

Injuries are complicated

2016



Windt and Gabbett, BJSM, 2016

Predicting injuries is near impossible

Coin toss:		50%
ECC hamstring strength in dynamometer:		56%
FMS:	FMS™ FUNCTIONAL MOVEMENT SCREEN	58%
Knee angle during drop jump:		60%

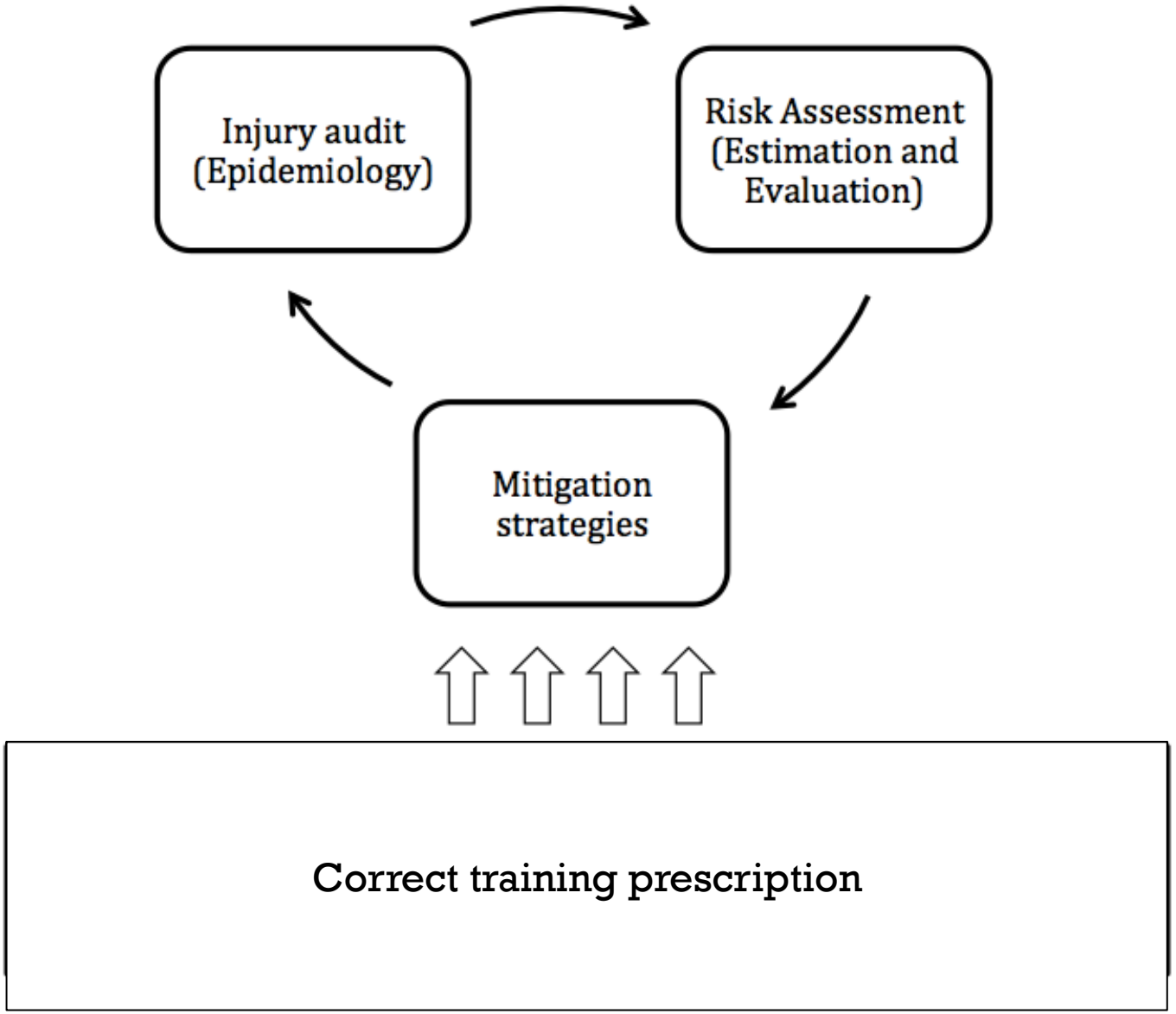
@JasonCTee

Bahr (2016); Dorrel et al. (2015)

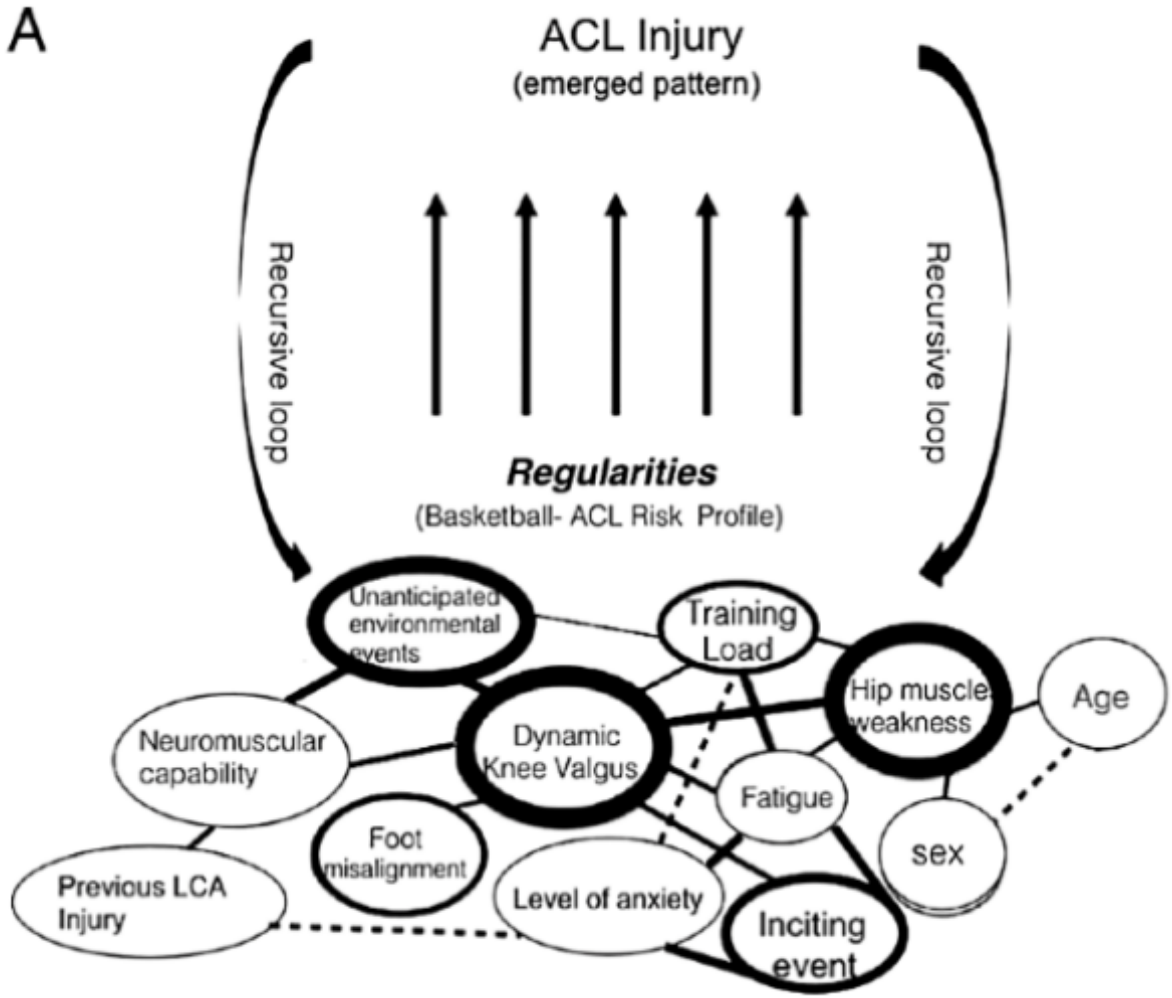
Injuries are complex and multi-factorial

One intervention is unlikely to make a significant difference

Use every tool in the box!!!

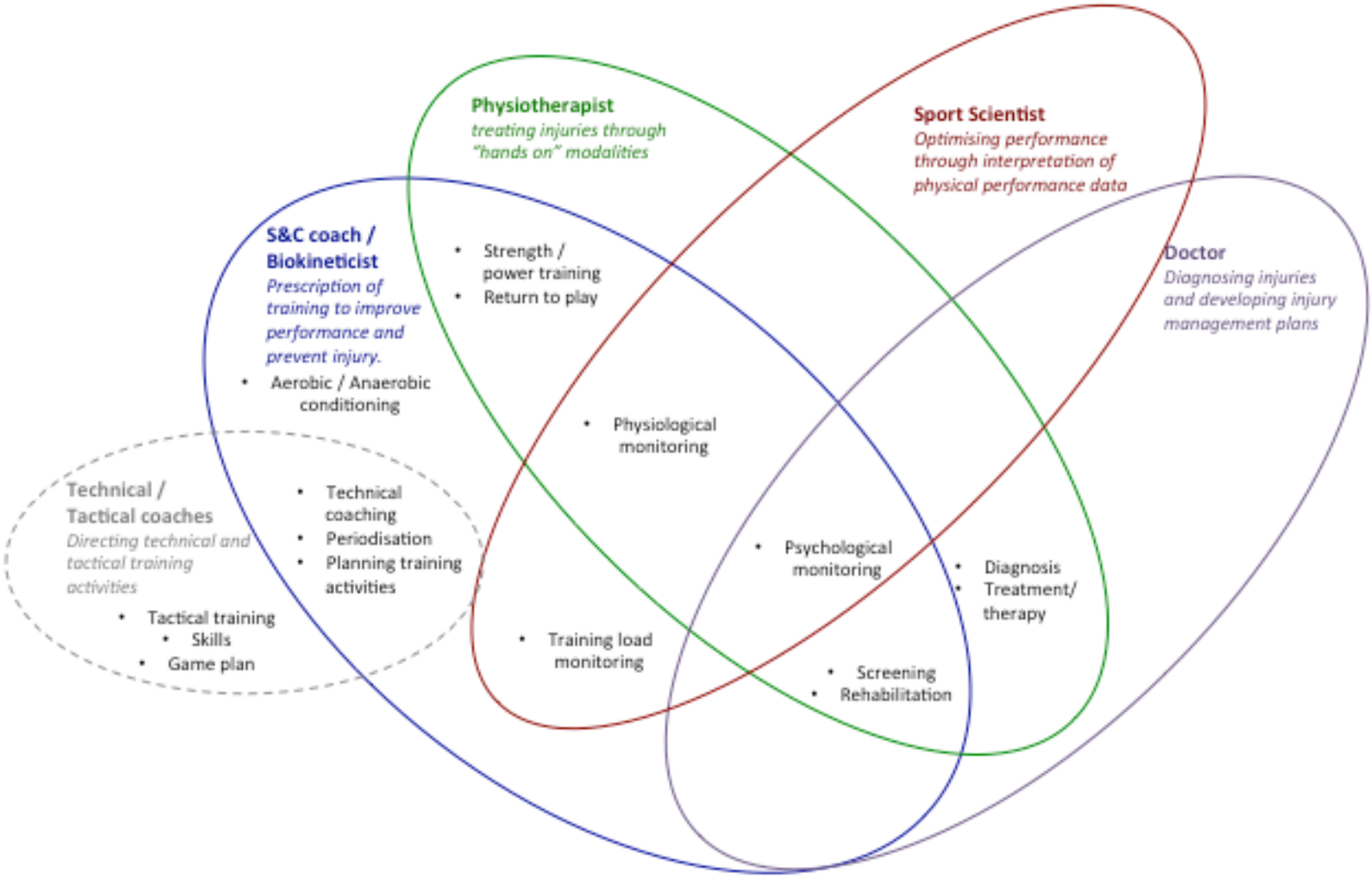

Injury audit (Epidemiology)
Risk Assessment (Estimation and Evaluation)
Mitigation strategies
Correct training prescription

Complex systems model



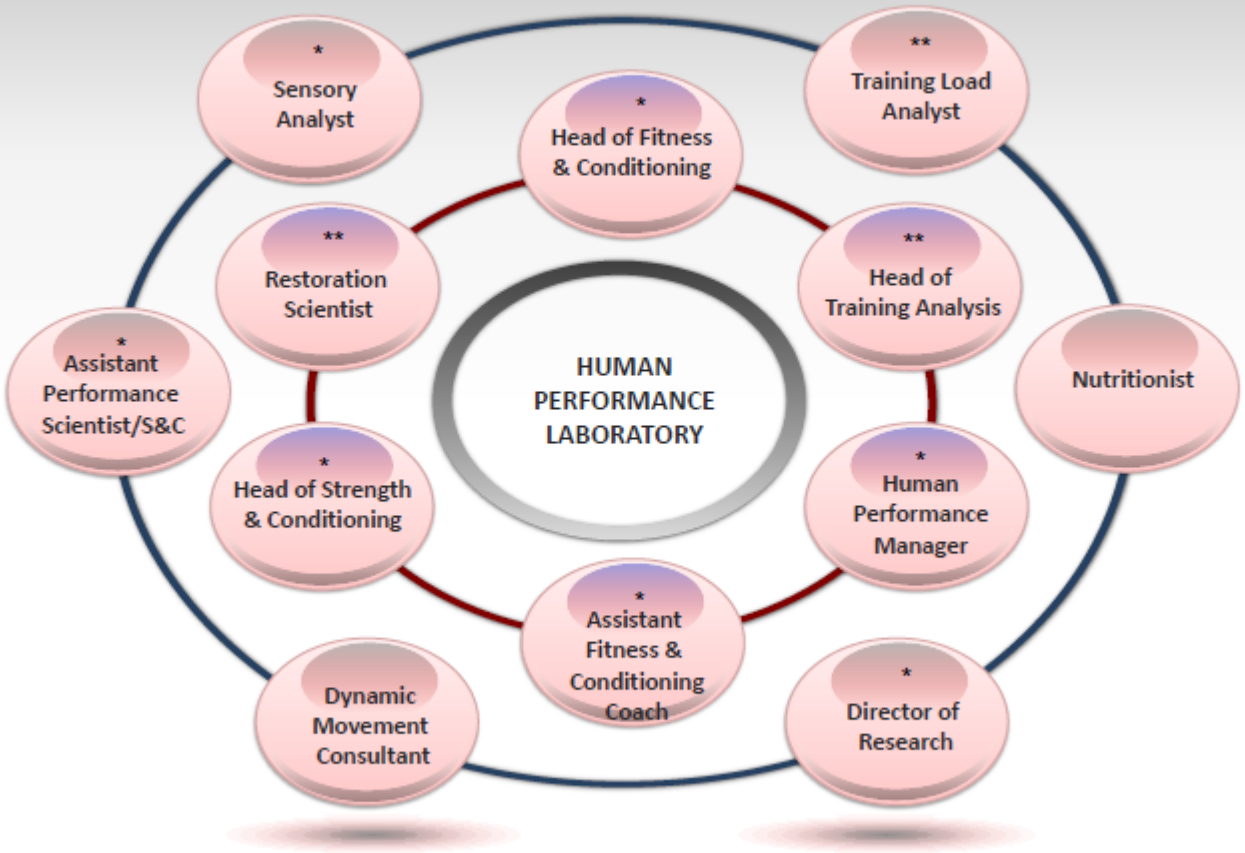
Bittencourt et al., BJSM, 2016

Multi-disciplinary approach to managing team injury risk



Current research on multi-disciplinary approach

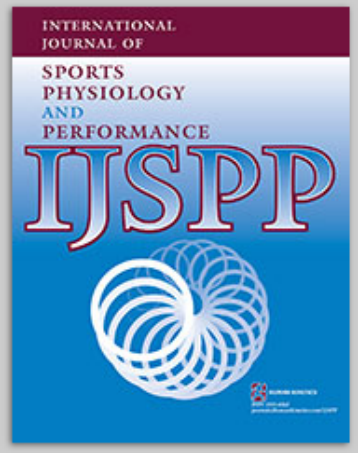
Current research on multi-disciplinary approach



England won the 1966 World Cup with n=7 technical and support staff

* n=7 x PhD

Current research on multi-disciplinary approach



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INVITED BRIEF REVIEW

Two Training-Load Paradoxes: Can We Work Harder and Smarter, Can Physical Preparation and Medical be Team-Mates?

Authors: Tim J. Gabbett[1]* Rod Whiteley[2]

AFFILIATIONS
[1]Gabbett Performance Solutions, Brisbane, Australia. [2]Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar. *Correspondence to: Dr. Rod Whiteley Aspetar Orthopaedic and Sports Medicine Hospital Doha, Qatar Email: Rodney.whiteley@aspetar.com

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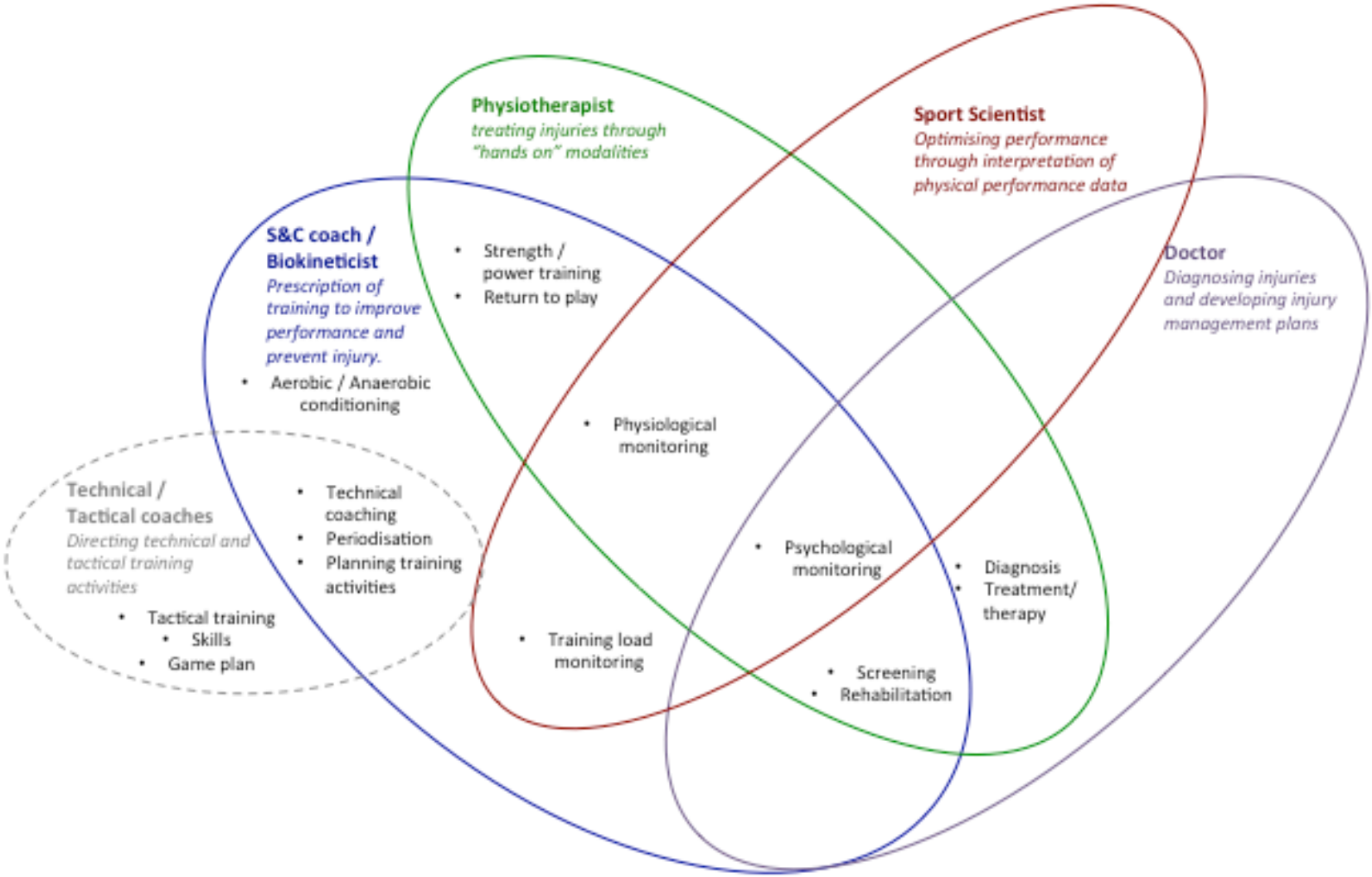
ABSTRACT PDF

We have observed that in professional sporting organisations the staff responsible for physical preparation and medical care typically practice in relative isolation and display tension in regards their attitudes toward training load prescription (much more, and much less training respectively). Recent evidence shows that relatively high chronic training loads, when they are appropriately reached, are associated with reduced injury risk and better performance. Understanding this link between performance and training loads removes this tension, but requires a better understanding of the relationship between the acute:chronic workload ratio (ACWR), and it's association with performance and injury. However there remain many questions to be answered in the area of ACWR, and we are likely at an early stage of our understanding of these parameters and their inter-relationships. This opinion paper explores these themes and makes recommendations for improving performance through better synergies within support staff approaches. Further, aspects of the ACWR which remain to be clarified, the role of shared decision-making, risk:benefit estimation, and clearer accountability are discussed.

Multi-disciplinary approach to managing team injury risk



Successes - Screening

Preseason Functional Movement Screen Component Tests Predict Severe Contact Injuries in Professional Rugby Union Players

Jason C. Tee,[1] Jannie F.G. Klingbiel,[2] Robert Collins,[2,3] Mike I. Lambert,[4] and Yoga Coopoo[1]

How does FMS predict contact injuries?

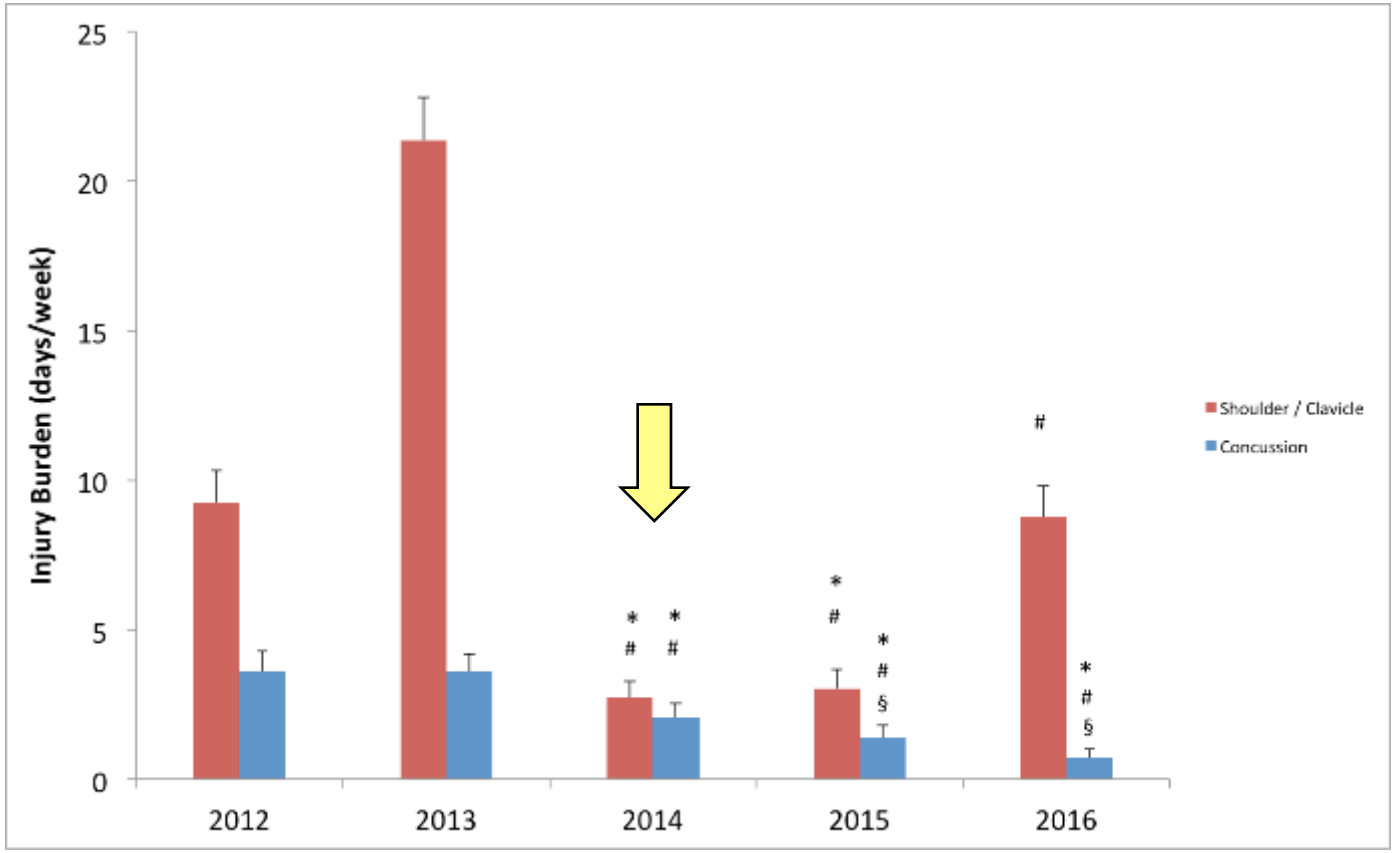
Dysfunctional movement pattern

Poor tackle technique

Successes – Tackle injuries

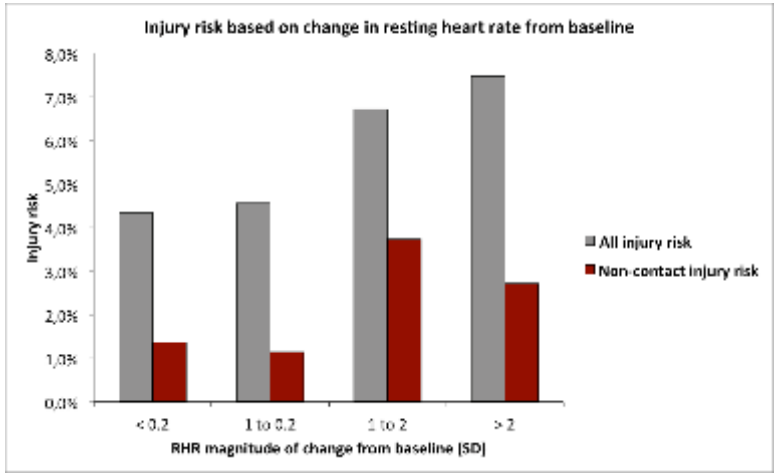
Interventions

- Specific strength program
- Increased exposure to contact skills training

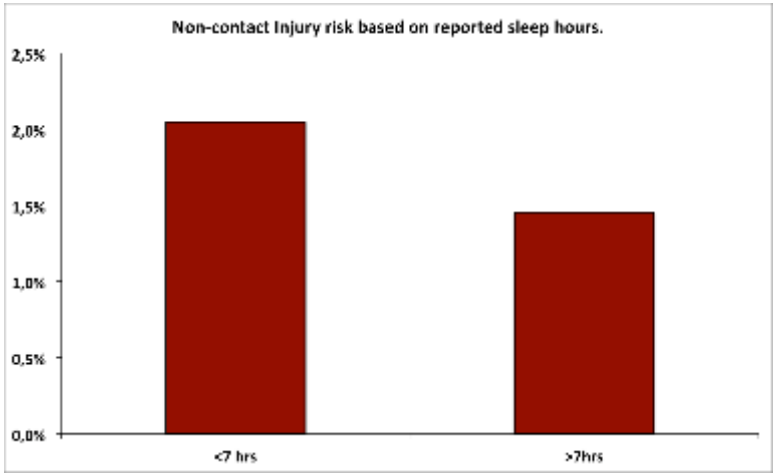


Successes - Monitoring

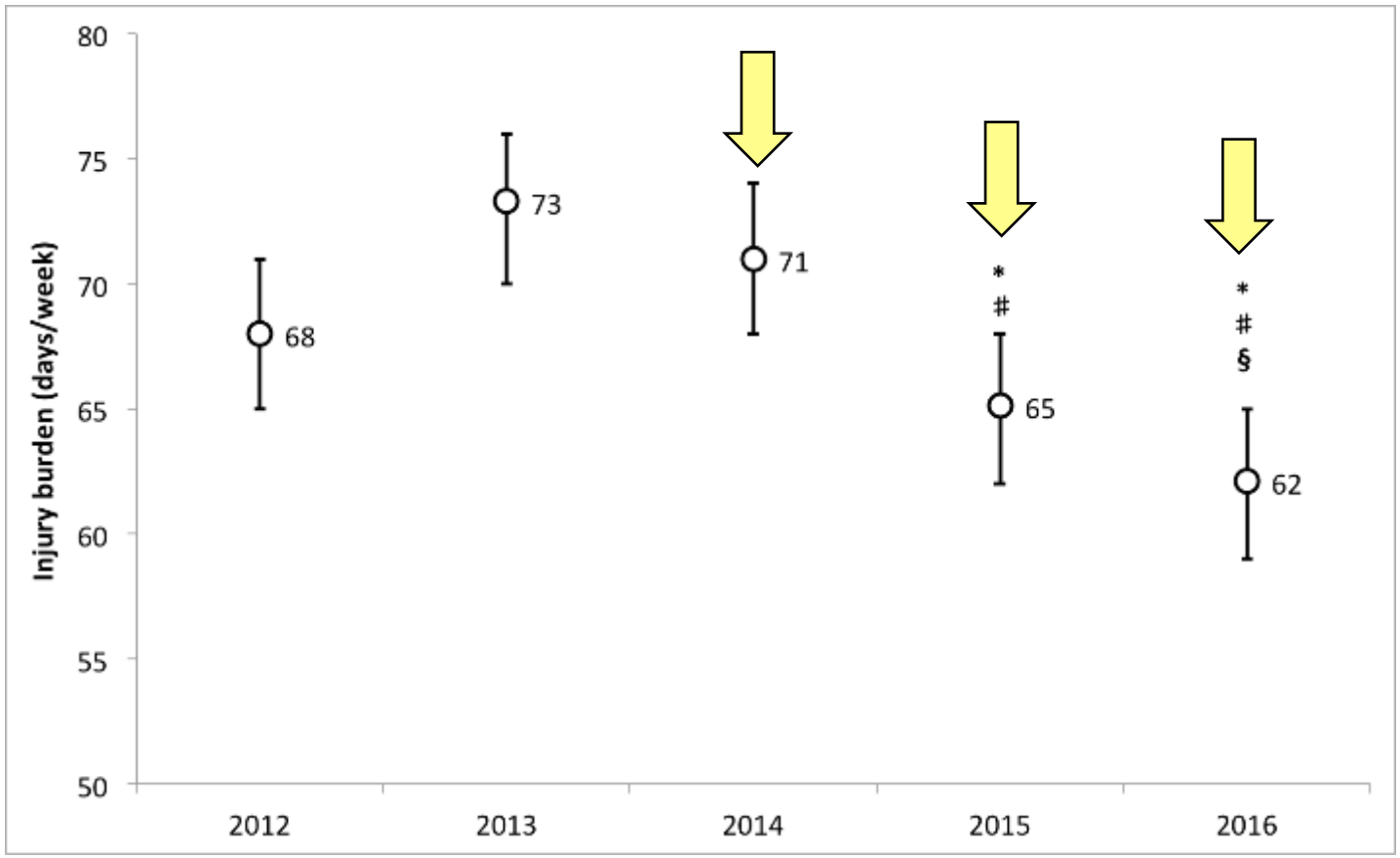
Resting heart rate



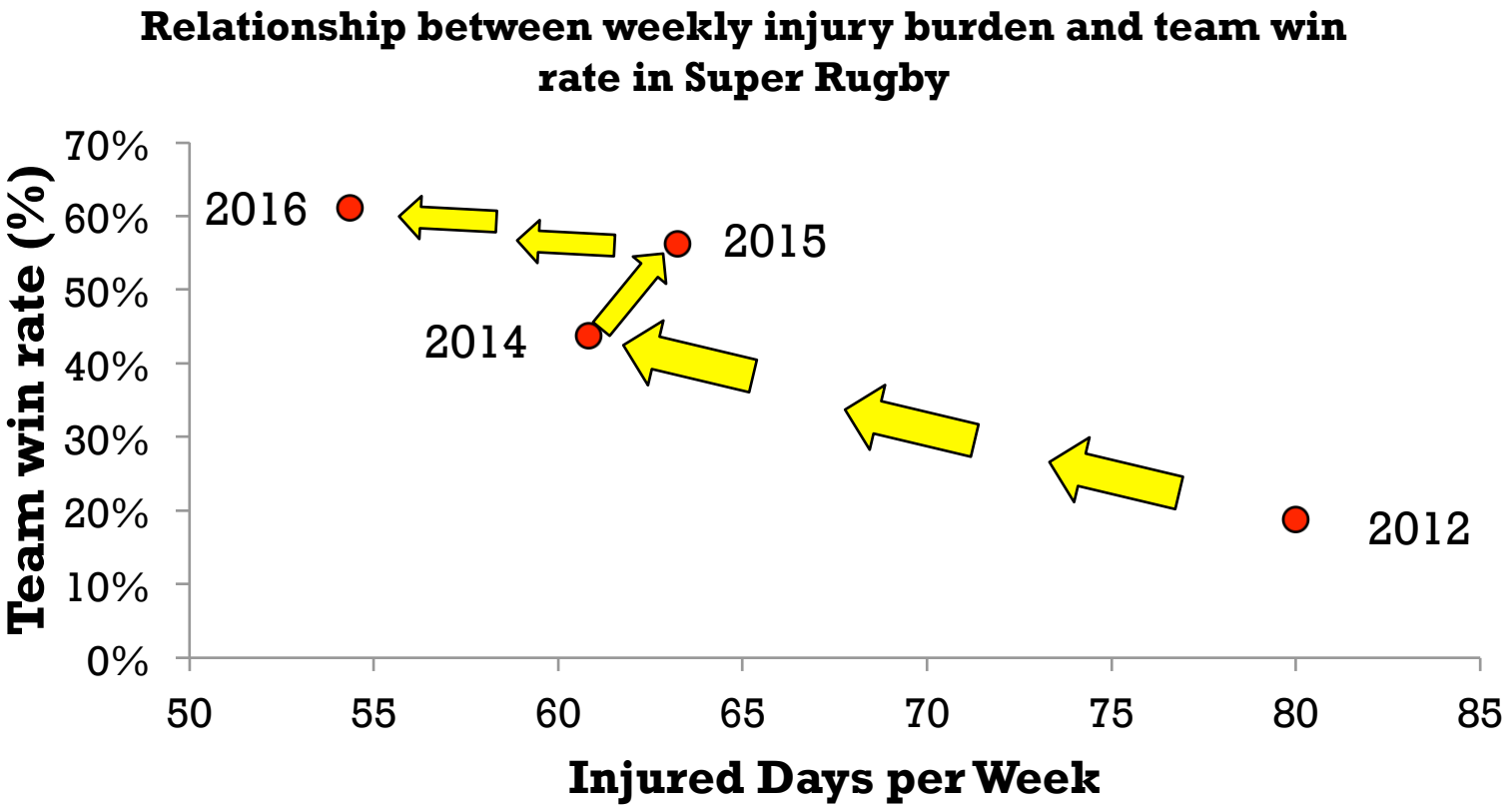
Sleep hours



Effectiveness of the multi-disciplinary approach



Effect on performance



Single team injury research

PERFORMANCE and ETHICAL MOTIVATIONS

Focused on CONTEXTUAL problems and solutions

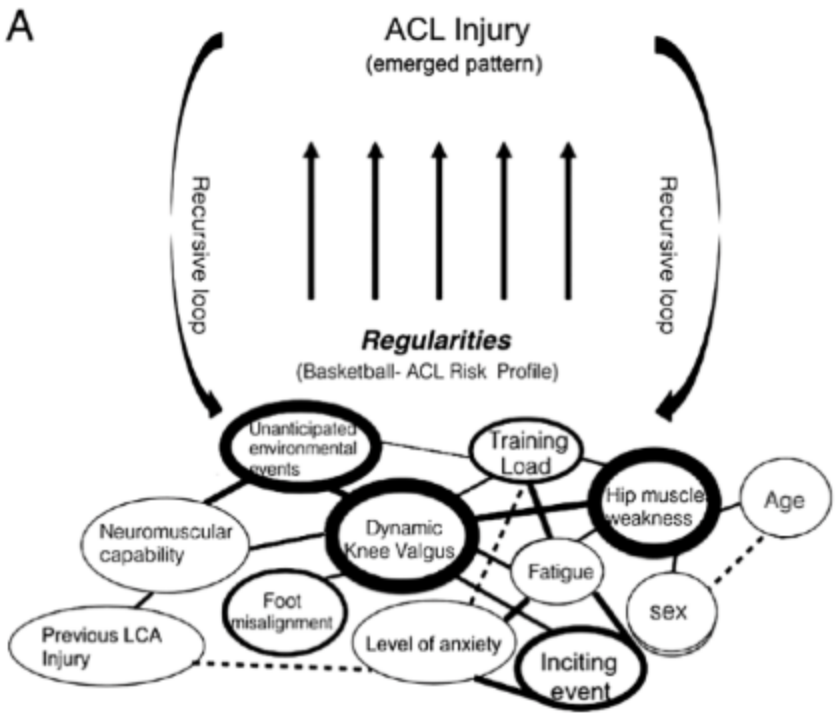
Provides information to INFORM large scale epidemiological studies

Single team injury research

Every team represents a unique & individual COMPLEX system

Applied injury research requires an understanding of how multiple risk factors interact in an emergent pattern

Multi-disciplinary teams are best equipped to affect complex systems



Thank you for your attention!!!

Are there any questions?